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TROPICAL PLANTING

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TROPICAL PLANTING

AND

INSTRUCTIONS FOR USING

PLANT FOOD.

PUBLISHED BY
GERMAN KALI WORKS,
93 NASSAU STREET,
NEW YORK, U. S. A.

NOTICE.

This pamphlet has been translated into Spanish, and a copy in either the Spanish or English language will be sent free to all who apply for it.

GERMAN KALI WORKS,
93 NASSAU STREET,
NEW YORK, U. S. A.

INTRODUCTION

PLAIN FACTS ABOUT MANURING.

Growing plants require air, light, water, and a fertile soil.

A soil is said to be **fertile** when it contains a bountiful supply of plant food in such form as to be readily taken up by growing plants.

A soil is "poor" or "sterile" when it does not contain enough plant food in suitable form for the proper growth of plants. Though such soils may have air, light, water, and good cultivation, plant growth is checked through lack of food.

A soil becomes "exhausted" or "worked out" when its supply of available plant food has been largely removed by successive growths of plants. As fruits and vegetables are matured and used for food or other purposes, the plant food required for their growth is removed with them; and, unless an equal amount is returned as manure or fertilizer, the land rapidly becomes sterile.

The planter who fertilizes his plants is simply providing them with food. In the feeding of plants, true economy suggests liberal feeding. Just as a half fed animal can perform only a small part of the work which may be expected of the same animal when liberally fed, so a soil but partially supplied with plant food can produce only a portion of the crop which may be obtained if liberally fertilized.

A soil may contain ample supplies of plant food and still fail to yield bountifully, due to the soil being too hard, too dry, too wet, or other causes. The object of tillage, drainage, plowing, etc., is to correct these unfavorable conditions. It is not enough to merely seed or set plants and fertilize; the soil must also be tilled so as to form a favorable bed for the growing plants. Of all aids to the planter, however, the most important is what we have called plant food.

PLANT FOOD.

All life, vegetable or animal, requires besides air, water, light, and a favorable habitation something to renew worn out tissues, and build up new ones. In animal life this is called food, in vegetable life the planter calls it manure or fertilizer—plant food.

Manures or fertilizers exist in many forms, but they are all useful as plant food only as they contain the three ingredients: **Nitrogen, Potash** and **Phosphoric Acid.** Plants require all three of these ingredients; no excess of any one ingredient, or of any two, can make up for the absence of any one. They must have all three, and also at the same time—the whole growing life of the plant.

The plantation name of plant food is manure; that is, the various forms of plantation refuse. If everything grown on the plantation were reduced to this refuse and returned to the soil, exhaustion would be very slow; but, as the object of planting is to produce products for sale and consequent removal from the plantation, it follows that the refuse is insufficient to maintain the fertility of the soil.

To restore to the soil the plant food removed in the form of sale products, various mineral substances, animal matter, etc., containing plant food, are used. These are sometimes called "artificial manures," but are now more generally known as "fertilizers," "chemical fertilzers," or "commercial fertilizers." These materials always contain at least one of the ingredients of plant food, (nitrogen, potash, or phosphoric acid), some contain two of the ingredients, and more rarely even all three. As plants must have all three, the most common practice is to make a mixture of various substances of such a nature that the mixture gives nitrogen, potash, and phosphoric acid in such proportions as are found by experience most suitable for a bountiful plant growth.

Plant food is not wholly confined to nitrogen, potash, and phosphoric acid. Other substances are necessary, but in such small quantities that most soils hold practically an inexhaustible supply. What we have called the ingredients of plant food—nitrogen, potash, and phosphoric acid—indicates only those elements of plant food which quickly become exhausted, and which must be restored to the soil in order to maintain plant growth. It is well for planters to keep in mind that manures, or fertilizers, are only just so much nitrogen, potash, and phosphoric acid, so far as they have any value to growing plants. The problem of rational and successful fertilizing, or plant feeding, is simply the question of supplying the three ingredients of plant food, in proper form and in sufficient quantity to meet

the requirements of the plants to be grown. The economical and successful use of these three substances therefore, necessarily involves a knowledge of their sources and properties.

NITROGEN.

Nitrogen is a constituent of all animal and vegetable matter. For fertilizing purposes it is largely obtained from by-products, resulting from the manufacture of animal and vegetable materials. Among the most important of such substances may be mentioned tankage, slaughter house refuse, dried blood, fish scrap, Sea Island guano, castor pomace and cotton seed meal, The latter, at the present time, both in quantity and desirable properties, stands at the head of such materials.

Two important nitrogen compounds of mineral origin furnish a very large part of the nitrogen used for manurial purposes, viz.—(1) nitrate of soda, frequently called Chili saltpetre, and (2) sulphate of ammonia, which is a product from the manufacture of illuminating gas from coal. Nitrogen in these two forms is wholly soluble. It is, therefore, immediately available to the plant. Nitrate of Soda doubtless furnishes nitrogen in the most quickly available form. But so soluble and readily available is this material that on many soils and for plants on which large quantities must be applied, the total application should not be made at one time. There should be two or three applications of Nitrate of Soda at different times, and then there will

not be so much wasted by leaching through the soil before the plants can actually consume the total supply needed.

Nitrogen, in the organic forms mentioned, is not immediately available, and should therefore be applied and thoroughly incorporated with the soil some time before the plants will actually need the same. Of these sources of nitrogen, dried blood, fish scraps, tankage and cotton seed meal are the most readily available and unquestionably the most desirable and economical.

The air surrounding all plants consists chiefly of nitrogen. Certain plants belonging to the class called "legumes" are able to secure most, or all, of their nitrogen from the atmosphere through the action of invisible organisms found upon the roots of such plants. The most important plants endowed with this power are peas, beans, and the different varieties of clover, including alfalfa.

Leguminous plants are not only able to draw their own supply from the air, but as the nitrogen thus secured becomes a part of the plants themselves such may be used as manures by being plowed under. This process is called "green manuring." Planters who follow this practice are able to produce good returns without buying expensive supplies of nitrogen in the form of commercial fertilizers. Green manuring, aside from its economy, has the further advantage of increasing the humus of the soils, whereby their absorptive powers or physical condition become improved. The amount of nitrogen thus obtained free from the air depends on the growth and yield of the leguminous plants. There-

fore, the planter should endeavor to increase the supply of free nitrogen, and this can be done by furnishing liberal amounts of phosphoric acid and potash to such leguminous plants. The larger the supply of phosphoric acid and potash furnished leguminous plants, the greater will be the amount of nitrogen extracted from the air, and, therefore, the larger the quantity of free plant food which can be used for increasing the fertility of the soil.

In warm climates, and particularly on light, sandy soils, large quantities of vegetation, if plowed under when still green, have a tendency to produce sourness in the soil by the accumulation of organic acids. This may be remedied by the application of moderate quantities of lime to such soils after the green manuring plants have been plowed under. A better course, wherever possible, is to allow the plants to mature and die on the soil where they grew and then to plow the same under later in the season when the weather has become cooler, so that the decomposition of the vegetation takes place more slowly.

The plowing under of leguminous plants is to be recommended only when the soil is quite deficient in nitrogen, otherwise, the feeding value of such is greater than its manurial value to soils already fairly well supplied with this constituent.

POTASH.

Potash is a valuable and important constituent in all plants. In the form of wood ashes, the potash offered for

sale is an uncertain quantity. Genuine wood ashes should contain about 9% of actual potash, and yet most of the material offered for sale under this name contains less than one-half of this quantity of actual potash. In fact, wood ashes as a source of potash are fast disappearing from the market.

The great potash supply of the world comes from the mines at Stassfurt, Germany. Some of the different forms of potash salts may be named as follows:

Kainit. This is perhaps the most widely known of the potash salts though it contains the smallest quantity of actual potash. Aside from its plant food value, Kainit possesses very decided properties as an insecticide and fungicide which makes it particularly valuable upon certain crops, especially cotton.

Muriate of Potash is the most economical form of potash upon the market to-day. It contains an average of about 50% of actual potash. For certain crops such as tobacco and oranges, sulphate of potash, or sulphate of potash-magnesia, is a more desirable form of potash supply.

Sulphate of Potash contains about 50% actual potash, and, being free from chlorine, is especially suited for tobacco, oranges and crops influenced by that ingredient.

Sulphate of Potash Magnesia contains about 26% actual potash, and can, like the sulphate, be used on all delicate feeding crops.

PHOSPHORIC ACID.

Phosphoric Acid is always supplied to plants in the form of phosphate of lime. As this material is the natural constituent of the bones of animals, some form of animal bone has always furnished the chief supply of phosphates for fertilizing purposes.

Some years ago this material was furnished exclusively by the bones of slaughtered animals. Of late years, the bones of petrified, prehistoric animals have come into extensive use. There are also rock phosphates of exclusively mineral origin. In all cases, however, the material is a phosphate of lime and phosphoric acid is its essential constituent. Phosphates of lime, whatever their sources, are always comparatively insoluble. For this reason all commercial phosphates are treated with sulphuric acid which possesses the chemical property of converting insoluble phophates into a soluble form, thus making them available to plants as food. This fact explains the use of different commercial names applied to phosphates, such as "dissolved phosphates", "dissolved rock", "dissolved bone-black" "acidulated rock", and "acid phosphate." These terms simply indicate that the orginial material has been treated with sulphuric acid, and the product put in comparatively soluble condition known as "available phosphoric acid."

Now, all of these different raw materials from many different sources with different origins contain and furnish to plants, exactly the same material, namely—phosphoric acid

and "available phosphoric acid" is available phosphoric acid under all circumstances. To illustrate: salt is always salt no matter whether it has been obtained from sea water, or from rock salt, or from saline springs. And so with phosphoric acid also. Whatever its origin it is equally available and useful to plants, and it is simply a question as to which source will furnish a given quantity of phosphoric acid for the least money.

Complete Fertilizers are those which supply all of the different kinds of plant-food for plants. In other words, complete manures are those which contain more or less of each of the three substances—phosphoric acid, nitrogen, and potash. Many planters regard barnyard manure as a complete manure under the supposition that it furnishes all of the plant food required by any class of plants. As a matter of fact, however, manure is very far from supplying all the food requirements of all plants. Stable manure is high in nitrogenous matter, but it is wanting both in sufficient phosphoric acid and potash. The latter ingredient because of its greater solubility, is usually lost by being washed out when the manure is exposed to the action of rain. Therefore, manure is not an economical fertilizer. The feeding of plants expressly with the idea of converting the same in to manure, is not profitable, as the money obtained by selling same would purchase a larger amount of plant-food than that contained in the manure produced. Thus, it has been found that by proper plant rotation and the plowing

under of green leguminous plants, the use of expensive stable manure may be largely, or almost entirely avoided.

As farmyard manure is one-sided in composition, its effect upon many plants is one-sided. Thus, when containing an excess of nitrogen the tendency is to increase the production of foliage rather than grain or fruit.

The one-sided quantities of manure may be largely counteracted by the use of mineral fertilizers, the result being the formation of a well balanced fertilizer, and the development of normal plants.

The tendency of manure is to decompose and lose its ammonia. This may be prevented by spreading kainit, or sulphate of potash over the manure as fast as it accumulates. One pound of kainit per day for each cow or horse, or for eight head of sheep is sufficient to absorb and retain all of the ammonia and thus prevent what would otherwise be a serious waste.

Lands already rich in humus, particularly muck soils, receive little benefit from applications of stable manure. The application of phosphoric acid, potash, and occasionally of lime on such soils will result in a better plant growth. The use of lime in this connection is not as a plant food, but simply because of its chemical and physical action upon soil constituents. It hastens the decomposition of organic matter and counteracts the acidity of soils, thereby sweetening the same and rendering them productive. Marl, chalk, air-slacked lime and ground shells are the common sources

of lime for agricultural purposes. Plaster, or gypsum, possesses somewhat similar properties in a reduced degree.

THE PROPER USE OF FERTILIZERS.

The real effect and value of different fertilizers depends largely upon the manner in which they are used, the condition of the soil, and the nature of the plants grown.

Potash salts should be applied some months or weeks before planting. Potash will not leach through the soil. An early application of muriate of potash and kainit is advantageous, for the following reason: The potash itself will be fixed by the soil, while the chlorine present, which is injurious to a few crops, such as tobacco, will be washed away.

Phosphoric acid should be applied some time before planting, especially in its less soluble forms, such as ground bone, etc. The soluble forms of phosphoric acid, such as dissolved rock, dissolved bone, etc. may be applied close to planting time. While phosphoric acid will not leach through heavy soils, it may leach through very sandy soils, and therefore an application close to planting time is desirable for such soils.

Phosphoric acid and potash will not prove of much value when applied as "top dressing" during the growing season. When so applied these fertilizers will stay on the surface and out of reach of the roots of the plants.

Phosphoric acid and potash are "fixed," that is, retained by the soil. They are not volatile, nor do they leach through the soil. It is quite different with nitrogen. Organic matter exposed to the air decomposes; a portion of its nitrogen volatilizes and is lost into the atmosphere. The remainder, unless absorbed by vegetation, is finally washed away. Nitrogen in the form of nitrates readily leaches through the soil. Nitrate of soda, therefore, may well be applied as a top dressing during the growing season. Fertilizers containing fish scrap, tankage, dried blood, etc., should be applied early, and then the nitrogen present will be converted into soluble forms for the following season.

The "commercial fertilizers" now in the market are the most desirable supplements and substitutes for stable manure that can be obtained by the farmer. In "complete fertilizers" the nitrogen, phosphoric acid and potash are skillfully compounded in various proportions. They are in a finely ground and thoroughly commingled condition, can be applied by drilling, and can be easily mixed with the soil.

APPLICATION OF FERTILIZERS TO SPECIAL CROPS.

ALFALFA.
(La Alfalfa)

This is a valuable forage plant. It is perennial and lasts many years if supplied regularly with the necessary plant food. Several harvests may be made yearly. This plant is a legume and has the property of gathering nitrogen from the air for future use as a fertilizer. It cannot, however, be used to advantage as a "catch" plant. Alfalfa should follow clean cultivation, as in its earlier stages it is easily smothered out by weeds. It is not a good pasture grass.

Soil. Alfalfa has a deep tap root, hence it requires a mellow or gravelly subsoil. It grows well even during seasons when want of rainfall would destroy most plants of the same class. The first stages of growth are feeble, and the soil must be in good condition. Clay soils having an open subsoil should be limed at the rate of 2000 lbs. per acre; the same is true for very light sandy soils.

Fertilizer. Alfalfa requires very little manuring with nitrogen, except at seeding, or if the foilage by its yellow coior betrays lack of nitrogen. An application need never be greater than 200 pounds of Nitrate of Soda sown broadcast. If the soil is naturally rich in humus, one half of this is sufficient.

The plant requires ample supplies of potash and phosphoric acid. It can only make growth or store up nitrogen from the air by a liberal feeding of these fertilizers. Apply 75 pounds of actual potash, and 50 pounds of available phosphoric acid broadcast every year. The fertilizer application may consist of 700 lbs. per acre of the following fertilizer:

Potash, 10%
Phosphoric Acid, 7%

If cotton seed meal is used as a source of nitrogen it must be harrowed into the soil before seeding to give the plants a good start.

BANANA.

Plátano)

The banana makes a rapid growth and must have a a favorable soil and liberal supplies of quickly available plant food. An ample supply of water is necessary, hence the cultivation should be as clean as possible.

Soil. A light soil, level and moist is most favorable to the growth of banana. Soils rich in vegetable matter are desirable. Lime must be used to aid in decomposing vegetable matter, and to prevent a too free percolation of water in very light soils.

Fertilizer. Soils rich in decaying vegetable matter need no fertilizer nitrogen. The application per acre should be 700 lbs. of the following fertilizer:

Potash, 10%
Phosphoric Acid, 10%

If the leaves show a pale color the plants need nitrogen which is best supplied in the form of Nitrate of Soda at the rate of 100 to 200 pounds per acre.

PLANTAIN.

(Plátano Macho.)

This vegetable should have about the same treatment as that given sweet potatoes or yams. Under cultivation it improves both in quality and in amount of yield.

Soil. Light sandy loam is well suited for plantains. It must be deep and worked deeply for planting.

Fertilizer. Apply per acre 800 lbs. of fertilizer containing:

Nitrogen,	3½%
Potash,	10%
Phosphoric Acid,	7%

If the soil is naturally rich in decaying vegetable matter, reduce the nitrogen one-half. Some prefer muriate of potash instead of the sulphate, that is, if it is applied to the soil some weeks before setting out the shoots.

BEAN.

(Frijoles.)

Beans belong to the family of legumes and thus have the property of taking nitrogen from the air. As a class, they all require clean cultivation and liberal applications of potash and phosphates.

Soil. Heavy soils, or clay loams give best results,

BANANA PLANTATION NEAR HONOLULU, HAWAII.

though beans grow well on light soils if the water supply is maintained.

Fertilizer. Too much nitrogen gives a heavy crop of vine, but a light crop of seed. Apply per acre 400 pounds of the following fertilizer:

Potash, 10%
Phosphoric Acid, 10%.

If the soil is light and contains little vegetable matter, add 100 pounds of Nitrate of Soda or 200 pounds of cotton seed meal.

CABBAGE.

(Col)

This vegetable, as well as other varieties of **Brassica oleracea** requires a quick growth for best results. Cabbages should always have a thoroughly clean cultivation, and must not be planted on the same land several years in succession.

Soil. The plants require a mellow soil, and if grown on sod lands, liming is desirable. The water supply must be abundant, though not excessive.

Fertilizer. The fertilizer supply must be liberal as the number of plants per acre is great. Apply per acre 1,000 pounds of fertilizer containing:

Nitrogen, 4%
Potash, 10%
Phosphoric Acid, 7%

If the crop has been planted on land "green-manured" by turned-under cow peas, the nitrogen may be omitted.

CARROTS.

(Zanahorias.)

Carrots may be grown successfully on dry soils. It is a valuable vegetable for the table as well as for stock feeding.

Soil. Sandy loam, well drained, is preferable. A soil rich in vegetable matter commonly produces irregular roots.

Fertilizer. Apply per acre, well worked into the drills 500 pounds of a fertilizer containing:

Nitrogen,	3%
Potash,	10%
Phosphoric Acid,	7%

If the soil contains much decaying vegetable matter, omit or reduce the nitrogen.

CASSAVA.

(Yuca.)

Cassava is grown from either its seed or from the stems or stalks of the preceding crop, which are cut into small sections containing joints which sprout, or sucker, exactly like sugar-cane. More commonly these cuttings are used for reproduction, in which case it is usually desirable to cut the sections about four inches long and to plant two such pieces in each hill. The same rate of seeding and distances apart would be followed where seed, instead of cuttings, are used. The plants are best grown in checks four feet apart each way, so that it may be worked in both ways like Indian corn (maize). It is cultivated very similarly to corn (maize) and can be grown as cheaply. The

plant has many uses, it being the raw material from which starch and tapioca are produced; it is a desirable form of human food and forms one of the most nutritious and profitable feed stuffs for all classes of domestic animals.

Soil. The plant will thrive on any soil that will produce maize. It does best, however, on light sandy loams, fairly retentive of moisture, but the plant withstands drought much better than is the case with maize, so that it thrives upon drier soils. Thorough and frequent cultivation is essential, this being particularly true on dry lands during times of drought where the preservation of an earth-mulch by constant, shallow cultivation is very essential. The desirable part of the plant is its root, which grows sufficiently near the surface to be easily harvested by a single man who can lift the entire root system of the plant from the soil without undue exertion.

Fertilizer. This plant, because of its carbonaceous character, evidenced by its high content of starch, derives an exceptionally large part of its food from the air, so that its soil food requirements are less than with most plants yielding equally heavy products. Upon fairly productive lands, an application of from 250 to 350 pounds of fertilizer per acre may be expected to return an average from 6 to 10 tons of marketable roots. The proper composition of such fertilizer would be:

Phosphoric Acid,	5%
Nitrogen,	3%
Potash,	6%

This amount of fertilizer seems to be consumed by the plants without waste so that there is no apparent advantage in divided applications, the entire quantity being most economically applied previous to the planting of the seed and preferably in a furrow, where it should be incorporated with the soil before the seed is dropped.

CLOVERS.
(Trebol)

Clover should have about the same treatment as we have indicated as suitable for alfalfa.

COCOA.
(Cacao)

A cocoa plantation should be so situated as to be sheltered as much as possible from hurricane wind storms. In the West Indies, it is not at its best in valleys of easterly and northerly direction. Cocoa seeds are usually planted in rows, about 12 inches apart, and 2 inches deep, and covered with plantain leaves. In about fifteen days the seeds will have sprouted, when the plantain leaves are removed. In 8 to 10 months they are transplanted with great care. The ball of earth adhering to the roots is carefully retained. They are set out about 12 feet apart each way. The first pruning should remove all weaker branches, or those which happen to cross others closely. The best months for pruning in the West Indies are March and April.

A model tree should be a single straight stem up to three

feet, and then branch regularly to secure an open top. Young trees require shade. For very young trees plantains or bananas are set out closely; later, "bucares," a species of Erythrina, are planted in the intervals between every third tree.

Soil. The tree roots deeply, and consequently must not have a hard clay subsoil. A moist level soil is best suited, but should not be subject to standing water.

Fertilizer. About 300 trees are set to the acre. The trees fruit in from 6 to 7 years, and reach full bearing in about 8 years. For the first three years $\frac{3}{4}$ of a pound of the following fertilizer should be applied in a circle of about 5 feet around each tree. Potash, in the form of Kainit, is of special value to this crop.

Nitrogen,	4%
Potash,	10%
Phosphoric Acid,	7%

For the next three years the application is doubled, but applied in the same manner. As the soil may have been previously rich in nitrogen, any indication of an excessive growth of leaf at the expense of wood, should be met by reducing the percentage of Nitrogen. At full bearing age the Nitrogen is reduced one-half, and the Potash somewhat increased, the Phosphoric Acid remaining the same.

A cocoa plantation must be kept free from weeds, and frequently cultivated. Cultivation not only conserves moisture, but also tends to stop the damage done by ants. In favorable soils well supplied with plant food a plantation

will remain in bearing about 35 years, but a neglected plantation will do well if it lives 20 years. Two crops a year are produced, but the yield will gradually fall off unless fertilizer is regularly used.

COCOANUT PALM.

(Coco)

Treatment of the cocoanut palm should be about the same as that given to cocoa. This tree is not usually cultivated, but proper care and attention would result in longer bearing life, and also in a greater yield of nuts. It needs a sandy moist soil, situated near the coast. At full bearing age each tree should receive about ¼ of a pound of a fertilizer containing:

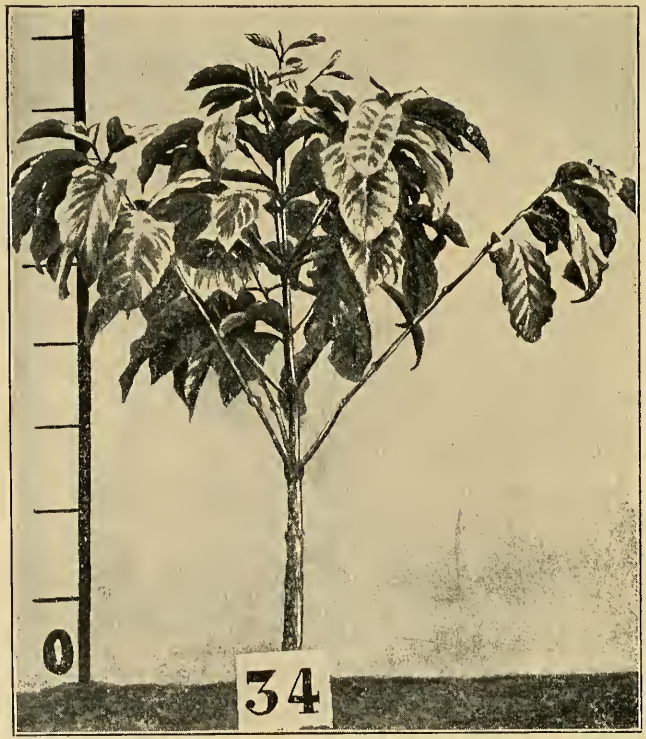
Potash,	9%
Phosphoric Acid,	6%

Planters should experiment with a few trees and note the results.

COFFEE.

(Café)

Young coffee trees are usually first raised in close rows, with clean and thorough cultivation. For this purpose, a rich loamy soil, highly charged with decomposed vegetable matter, is selected. To this natural manure is sometimes added, about one pound of Nitrate of Soda to every 100 feet of row. By thus encouraging the seedlings they may frequently be transplanted at the end of six months, though in the ordinary treatment at least a year is required. Seeds



COFFEE TREE—ONE YEAR OLD—FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN, (COMPLETE FERTILIZER) EXPERIMENT AT CAMPINAS, BRAZIL.

COFFEE TREE—ONE YEAR OLD—UNFERTILIZED—EXPERIMENT AT CAMPINAS, BRAZIL.

for planting should be selected carefully for quality and vigor. Transplanting is done with the usual care, and pains taken to preserve the ball of earth surrounding the roots.

For the permanent plantation, trees are usually set 9 feet apart each way, though this varies in different locations. The plantation should have clean cultivation. Seedlings should be selected with care, and all crooked stems or weak plants rejected.

Soil. Deep, loamy soils that are moist and have a gravelly subsoil, give the best results. A soft-timber soil is desirable for coffee culture. Very light sandy soils, or very heavy clay soils are unsuitable. Clay loams may be used, but they should be limed once every four years.

Fertilizer. Easily soluble fertilizers are most desirable, and yearly amounts should be distributed in two or three applications. For the first four years the following mixture should be applied at the rate of $\frac{3}{4}$ pound to each tree:

Nitrogen,	5%
Potash,	10%
Phosphoric Acid,	6%

Trees from five to eight years old should have each year two pounds of the following mixture:

Nitrogen,	4%
Potash,	10%
Phosphoric Acid,	7%

Trees eight years old and more should have annually for each tree, two pounds of the following mixture:

Nitrogen,	4%
Potash,	10%
Phosphoric Acid,	8%

The fertilizer should be thoroughly mixed with the soil about the tree, in a circle about equal to the spread of its branches. Careful attention to the above method of treatment will do much to maintain a high yield of berries, and also prolong the profitable bearing age of the trees.

CORN.

(Maiz)

On soils naturally rich, or very heavily fertilized, corn is planted in rows about four feet apart, plants about three feet apart in the row. On lighter soils the plants are about four feet apart each way. Cultivation is very thorough, and is always done with horse harrows. On fairly favorable soils yields of 80 bushels of shelled grain are not uncommon.

Soil. A well drained mellow loam is best, but any soil may be used which can be broken thoroughly. Soils predominating in sand are better than clay soils.

Fertilizer. Apply per acre, at planting time, and in the drills a mixture of 500 pounds, composed as follows :

Nitrogen,	2½%
Potash,	9%
Phosphoric Acid,	7%

Coarse manures, such as general vegetable or other refuse, may be safely used on corn. Legumes turned under for manure are also effective.

COTTON.
(Algodon)

Cotton is a native of sub-tropical climates. Its cultivation is simple, but success in its growth demands clean cultivation. The cotton crop requires distance between the plants in only one direction. If the plants are crowded in the row, the distance of the rows from each other should be not less than 4 feet for short staple varieties and 5 feet for the long staple. If, however, the distance in the rows is greater, the rows themselves may be reduced in width respectively to 3 and 4 feet. The secret of many exceptionally successful cotton growers has been simply in their thorough knowledge of the degree to which cotton could be crowded on the land, it being borne in mind, however that the greater the number of plants on a given area, the larger the supply of plant food which must be placed at their disposal.

Soil. Sandy loams are particularly adapted to the growth of cotton. Rich clay, particularly rich clay interspersed with fine gravel is, however, recognized as the typical cotton soil in short staple countries. Cotton is a tap rooted plant, well adapted to the standing of drought and abhors excess of moisture.

Fertilizer. Many successful cotton growers regularly follow the practice of crop rotation, the following of corn or peas by cotton and the plowing under of leguminous crops. The fertilizer application should furnish

Phosphoric acid,	8%
Nitrogen,	2½%
Potash	4%

and about 500 lbs. per acre used.

The potash should be applied in the form of muriate except where the land is known to be susceptible to blight, for which kainit is regarded as a specific.

FIGS.

(Higos.)

Figs are commonly grown from ripe wood cuttings set at the beginning of the rains. They require little pruning beyond removing suckers. They should have clean and thorough cultivation.

Soil. Sandy or sandy loam soils are preferable, if not deficient in moisture.

Fertilizer. Up to bearing age 400 lbs. of the following fertilizer should be used per acre.

Nitrogen,	2%
Potash,	10%
Phosphoric Acid,	8%

The fertilizer should be incorporated with the soil immediately surrounding the trees. If the soil is rich in vegetable matter, the nitrogen may be omitted.

GINGER.

(Agenjibre.)

This product is the root-like stem of the *Zingiber officinale*

COFFEE UNFERTILIZED. THIS IS THE SAME TREE AS NO. 33 TWO YEARS LATER. YIELD, 70.1 GRAMS COFFEE.

COFFEE FERTILIZED WITH COMPLETE FERTILIZER. SAME TREE AS NO. 34 TWO YEARS LATER. YIELD, 1295 GRAMS COFFEE.

(Rosc.). It is propagated by division of roots, and is planted in March or April and harvested in January and February

Soil. A deep, well-drained, though moist soil is best. It will not do well if subject to drought. Heavy clay soils are not favorable for growing ginger.

Fertilizer. The supply of nitrogen must be well under control, as the quality of the root is injured by an excess. For this reason, green manures, or refuse manures of any sort are not recommended. Five hundred pounds of the following mixture may be applied per acre:

Nitrogen,	1½%
Potash,	10%
Phosphoric Acid,	8%

Muriate of Potash or Kainit is not advised for ginger, unless applied several weeks before planting, a plan not commonly practical in tropical agriculture.

GRAPES.

(Uvas.)

Grapes are easily grown and respond to care and proper feeding as well as any crop.

Soil. Good drainage is the most important point. Sandy or gravelly soils are most suitable.

Fertilizer. The following application per acre may be made at rate of 700 lbs.

Nitrogen,	1½%
Potash,	10%
Phosphoric Acid,	5%

If the soil is rich in decaying vegetable matter, the nitrogen should be reduced one-half. Grape soils should be limed about every five years, at the rate of 2,000 pounds of air-slaked lime per acre.

HEMP.

(Cáñamo.)

The quality of hemp fibre, grown in the tropics, is seldom first-class. This is in large measure due to its rank growth, and to the lack of hastened maturity from the approach of cold weather.

Soil. Soils rich in vegetable matter make a good growth, but the fiber is second quality. Hemp grows well on nearly all soils, provided they are well drained.

Fertilizer. Apply per acre 800 lbs.

Nitrogen,	1½%
Potash,	10%
Phosphoric Acid,	9%

LENTILS AND PEAS.

(Lentejas y Garbanzos.)

These two vegetables require about the same conditions for growing as beans do. A well regulated water supply which is very largely a matter of close and frequent cultivation is necessary.

Soil. Peas require a sandy loam or clay loam soil. Lentils do well on the same soils. They also thrive on gravelly soils and will stand dry weather much better than peas.

CORN UNFERTILIZED—NORTH CAROLINA EXPERIMENT FARM, SOUTHERN PINES, N. C.

CORN FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN (COMPLETE FERTILIZER)—NORTH CAROLINA EXPERIMENT FARM, SOUTHERN PINES, N. C.

CORN UNFERTILIZED—NORTH CAROLINA EXPERIMENT FARM, SOUTHERN PINES, N. C.

CORN FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN (COMPLETE FERTILIZER)—NORTH CAROLINA EXPERIMENT FARM, SOUTHERN PINES, N. C.

Fertilizer. As these vegetables should grow quickly it is best to apply highly soluble fertilizers. Like all legumes, peas and lentils gather nitrogen from the air, but for early growth some nitrogen together with potash and phosphoric acid should be added. The following application may be made at the rate of 900 lbs. per acre.

Nitrogen,	1½%
Potash,	10%
Phosphoric Acid,	8%

The fertilizer may be applied in the drills at seeding time.

MELONS.
(Melones.)

Melons should be planted from 5 to 10 feet apart, each way. There should be clean cultivation as long as the growth of the vines will permit. The tendency to growth of weeds may be checked by having melons follow a hoed crop.

Soil. Sandy loam is perhaps the best, though most soils will produce melons if well fertilized and not too dry.

Fertilizer. Apply per acre, in the hill, a handful of fertilizer mixture, as follows:

Nitrogen,	2½%
Potash,	7%
Phosphoric Acid,	6%

About 1,200 lbs. should be used per acre.

Olives.

(Olivos.)

It takes many years before olive trees bear a profitable crop. However, the growth and yield may be hastened by regular cultivation and fertilization.

Soil. The olive will succeed on a dry, hard, gravelly or limestone soil, but it also shows the benefit of good soils. The principal point is good drainage and clean culture.

Fertilizer. Up to bearing age olive trees should have more nitrogen than after bearing age, when the nitrogen should be much reduced. The average fertilizer, per tree, at early bearing age, is 1½ lbs. of a fertilizer containing :

Nitrogen,	4%
Potash,	6%
Phosphoric Acid,	4%

After several years in bearing, the amount of potash and phosphate should be doubled, but the nitrogen may remain the same. For very young trees, one-fourth to one-half the ration should be used, depending on the development of the tree.

ONIONS.

(Cebollas.)

Onions require clean culture, and should be planted, or follow after, a clean cultivation crop. The soil must be open and porous, but need not be deep.

Soil. Light loam is most favorable, but a clay loam may be used successfully if limed. Onions grow well on soils

ORANGE TREE FERTILIZED WITH COMPLETE FERTILIZER, CONTAINING 13% POTASH, 5% PHOSPHORIC ACID AND 3% NITROGEN—DUMVILLE GROVE, FLORIDA.

LEMONS FERTILIZED WITH COMPLETE FERTILIZER, CONTAINING 12% POTASH, 4% PHOSPHORIC ACID AND 4% NITROGEN—DUMVILLE GROVE, FLORIDA.

rich in decaying vegetable matter, but unless potash and phosphates are used liberally, curing will be retarded.

Fertilizer. The following application should be made per acre at rate of 1,500 lbs.

Nitrogen,	4%
Potash,	8%
Phosphoric Acid,	7%

As onions are planted closely, this requires that the amount of fertilizer per acre be quite large.

ORANGES.

(Including Lemons, Grape Fruit, etc.)

(Naranja, Cidra, Limon, Cajelas, etc., etc.)

Few fruits show the benefits of cultivation and fertilization so well as the orange, lemon, etc. Not only are the trees brought more quickly into bearing, but they have a longer bearing life.

Soil. Oranges should have a deep, loose and well-drained soil. Light, sandy soil may be used if fertilized liberally. If the soil shows a tendency to sun-bake, or to drain moisture away too freely, lime at the rate of 2,000 lbs. per acre should be spread broadcast.

Fertilizer. Many practical experiments have proven that the orange and lemon crops remove considerable plant food each year from the soil. The amount of the three kinds of plant food removed in a crop of 20,000 fruit, in the fruit alone, is :

	Oranges.	Lemons.
Nitrogen,	37 lbs.	30 lbs.
Potash,	42 lbs.	54 lbs.
Phosphoric Acid,	11 lbs.	12 lbs.

As there is always considerable loss through leaching, larger amounts of fertilizer than above stated should be given to trees in full bearing. A suitable fertilizer per tree would be 20 lbs. twice a year of the following proportions:

Nitrogen,	4½%
Potash,	10%
Phosphoric Acid,	5%

This should be equally distributed among the trees, worked into the soil in a circle around each tree about equal to the spread of its branches. If the soil is naturally rich, the nitrogen fertilizer should be reduced one-half. For very young trees, from one to two pounds, depending on growth, should be worked into the soil about the tree. The quality of the fruit seems to be most favorably influenced by potash in the form of sulphate.

Peanut.
(Maní.)

This plant requires clean culture and frequent stirring of the soil until the branches begin to spread.

Soil. Sandy or sandy loam soils are most desirable. Frequent and heavy limings are necessary in order to ensure a series of good crops.

Fertilizer. Although this plant is a legume, the appli-

cation of nitrogen in a moderate quantity gives good results.

Apply per acre 600 lbs of the following fertilizer :

Nitrogen,	1%
Potash,	10%
Phosphoric Acid.	9%

If the soil is naturally rich the nitrogen fertilizer may be omitted.

PEAS. (Cow Peas.)
(Chicharos Gigantes.)

This plant is grown very largely all through the South, where it is valuable as a cheap, green manure. The crop is grown to cover bare soils to prevent the leaching out of soluble fertilizer ingredients during the rains. The cow pea holds these materials, and also stores up nitrogen in its leaves and stems, which, when plowed under serve as a fertilizer for a future crop. It is also an excellent forage crop.

Soil. Cow peas grow well on nearly all soils, and they make a good growth on light, leachy, sandy soils. Besides supplying nitrogen they add lumus and thus improve soils for other crops.

Fertilizer. Cow peas require, of course, no nitrogen fertilizer, and should be fertilized per acre at the rate of 500 lbs. as follows :

Potash,	10%
Phosphoric Acid,	9%

The fertilizer is usually applied broadcast.

PINEAPPLE.
(La Piña.)

This plant is reproduced from slips, or suckers, growing up from the parent plant, and also by the crowns forming the tip of its fruit. It is adapted to close, clean cultivation, the slips being transplanted into rows two and one-half to three feet apart and usually 18 inches apart in the rows. This process should take place during the rainy season for its best results. In the natural habitat, the pineapple grows more or less shaded by other vegetation. In Florida advantage has been taken of this fact to cultivate fruit under artificial sheds which furnish protection against possible frosts in cold weather and against the excessive heat of the sun in hot weather. The result is the production of fruit very much superior in every way to that grown under any other condition, the fruit not infrequently weighing 10 to 15 pounds each and bringing prices very much more than compensating for the additional cost of production.

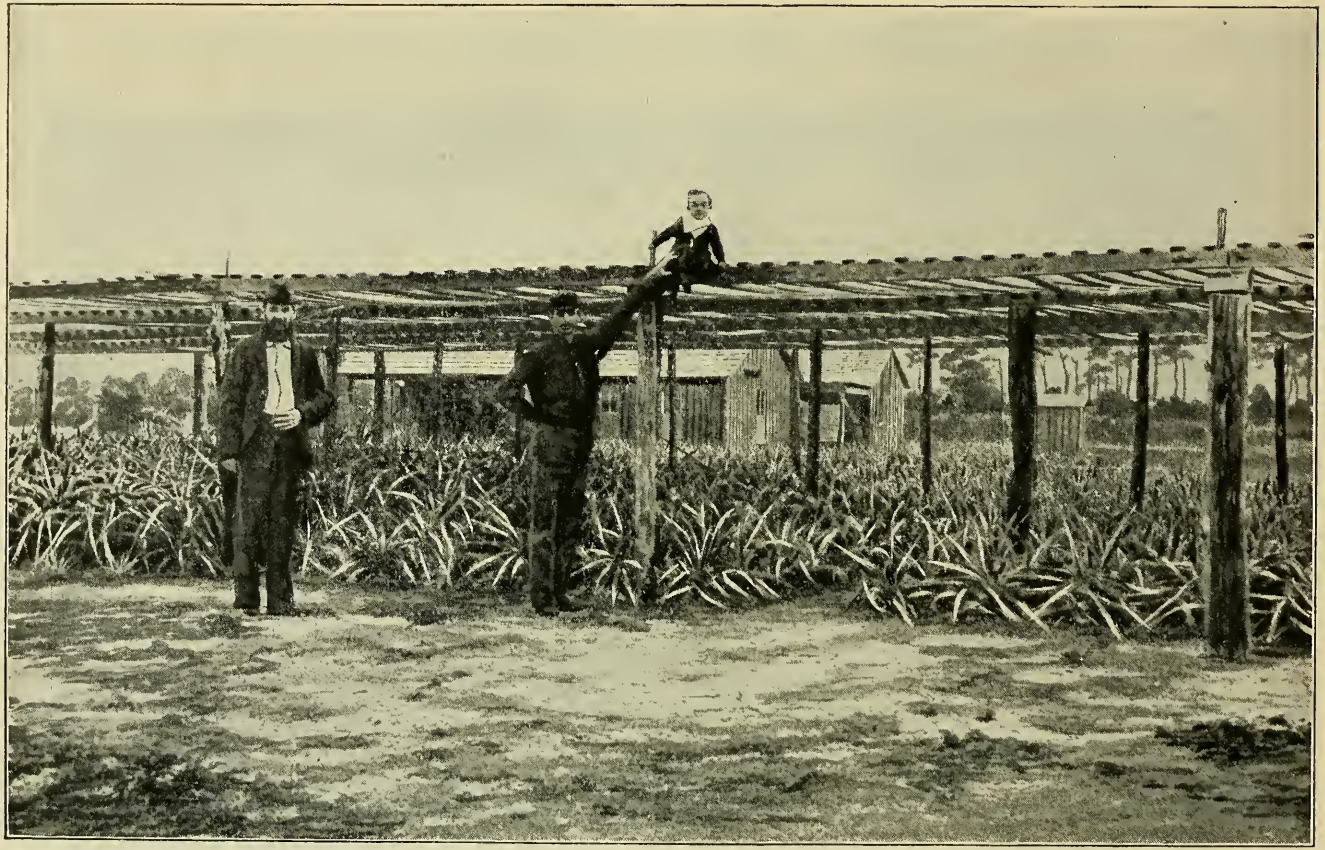
Soil. Very light, sandy loams are the natural home of the pineapple.

Fertilizer. The plant is a heavy feeder and requires liberal supplies of plant food which should furnish

Phosphoric Acid,	5%
Nitrogen,	3%
Potash,	9%

Experience has shown that best results followed the division of the application into two or three parts cultivated

PINEAPPLE EXPERIMENT. FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN (COMPLETE FERTILIZER) BY FLORIDA EXPERIMENT STATION, AT FORT MEADE, FLORIDA.



RAISING PINEAPPLES UNDER SHED (HEAVILY FERTILIZED)—PLANTATION OF T. J. ZIEGLER, JUPITER, FLORIDA.

into the soil during the season, the rate of application being preferably not less than 1,500 lbs. per acre.

POTATOES.

(Papas.)

A few words only as to this plant. It grows on all soils. The soil should be well drained and worked deeply. It should have frequent cultivation until the blossom appears, after which tillage ceases unless necessary to reduce weeds.

Fertilizer. Apply per acre 700 lbs. of fertilizer containing:

Nitrogen,	3%
Potash,	10%
Phosphoric Acid,	7%

The potash and phosphate should be applied some weeks before seeding, and the nitrogen at seeding time. If the potash must be used at seeding time, only sulphate of potash should be used, at the rate of 150 lbs. per acre. Larger amounts of fertilizer are made with profit, but the above is suggested as a fair average.

RAMIE.

This is a fiber plant that requires thorough tillage, both for keeping down weeds and for conserving moisture in the soil. Plowing should be deep and followed by cross plowing. Propagation is by seeds, cuttings, or by division of the roots. Plants are commonly grown in beds and transplanted. The young plants require shade until shortly

before transplanting, when they are gradually hardened to exposure to a strong sun.

Soil. Ramie is grown on all types of soils, but gives best results in sandy loam, or light clay loam.

Fertilizer. A fair crop, say 14 tons of vegetable matter, will remove from the soil 370 pounds of nitrogen, 260 pounds of potash, and 160 pounds of phosphoric acid. To make a good growth of fiber, there must not be too much nitrogen. If the soil is naturally rich the amount of nitrogen here given should be reduced fully one-half. The following application may be made at the rate of 800 lbs. per acre :

Nitrogen,	3%
Potash,	10%
Phosphoric Acid,	5%

The fertilizer is used in two applications yearly.

RICE.

(Arroz.)

A hard, flinty water rice is difficult to produce in a tropical climate, but the crops should never be allowed to suffer from drought.

Soil. Strong rich soils are necessary, though lighter soils may be used if fertilized freely.

Fertilizer. Apply per acre 450 lbs. of this fertilizer :

Nitrogen,	3%
Potash,	9%
Phosphoric Acid,	6%

RICE PLANTATION ON ISLAND OF OAHU, HAWAII.

SUGAR CANE (UNFERTILIZED), HONOLULU, HAWAII.

SUGAR CANE (FERTILIZED), SAME AGE AS CANE ABOVE, AND JUST BEGINNING TO SHOW EFFECTS OF FERTILIZATION.

SISAL.

(Henequen.)

This plant is grown for its fiber, of which it furnishes a good substitute for hemp, so that the crop is not infrequently called "sisal-hemp."

Soil. It thrives best upon gravelly or sandy loam, since richer or heavier soils produce a rank growth yielding inferior fiber. Clean cultivation is essential to the plants which are set about 9 feet by 6 feet apart. Greater distance, however, is preferable to less, inasmuch as if the leaves are swept together by the wind, the fiber is liable to damage. It continues to yield crops for 6 or 8 years, consisting of the lower and older leaves, which should be regularly removed.

Fertilizer. Should consist of—

Phosphoric Acid,	6%
Nitrogen,	3%
Potash,	9%

And 800 lbs. per acre applied.

SUGAR-CANE.

(La Caña de Azúcar.)

This is a typical West India crop, being their chief single source of revenue and forming the basis of their largest agricultural industry.

The plant will go on producing profitable crops for five or six years on very ordinary soil, which has had no fertilizer. On "new" lands or alluvial soils, rich in humus, the

yield will be very large, and in such places cane may be grown continuously for a period of 25 to 30 years.

There is no doubt, however, that the best results are obtained when the lands are properly fertilized. The most successful planters in Cuba will be those who pay the most attention to this matter of maintaining the fertility of the land, thereby insuring large crops.

The plant is propagated by the laying down of canes grown the previous year. They are laid in furrows, which subsequently become the cane rows of future growth. The crop is occasionally reproduced by the transplanting of old stubbles, though this is not usually satisfactory. The planting by small sections from the stems is the best and the most generally adopted. The "quincuncio" form (that is, planting at equal distance, usually about 6 feet) is preferred, as it insures air, light and the sun's heat in the same proportion to each plant, and economizes the space used. Moisture is thus more evenly distributed. The cost may be a little more, but a greater yield and a better quality of the cane will fully compensate the outlay. The cuttings should be carefully selected, if there are too many "joints" they will not sprout. To provide against this, two cuttings instead of one should be placed in the furrows, about 6 or 7 inches apart, in parallel lines. Thorough tillage, deep plowing, stirring of the soil, frequent and clean cultivation will not fail to bring good results. The planter should remember that when the soil is properly prepared, the roots make a better growth, and the more

SUGAR EXPERIMENT STATION, HONOLULU, HAWAII. CANE ON LEFT IRRIGATED, ON RIGHT NOT IRRIGATED; CANE ON BOTH SIDES OF SAME AGE.

EWA SUGAR PLANTATION, NEAR HONOLULU, HAWAII. CANE ON LEFT HEAVILY FERTILIZED, YIELDED 14 TONS SUGAR PER ACRE.

easily and rapidly the roots assimilate vegetable and organic matter from the soil, the quicker and the better the development of the whole plant. At the first appearance of weeds, the harrow or the cultivator should be run over the cane field.

Soil. Deep, sandy loams and alluvial soils are the natural habitat of sugar-cane. Well-drained clay loams are also adapted to the crop and some of the best plantations are located upon drained muck soils, where the yield of cane is exceptionally heavy, though the content of sugar is comparatively low.

Fertilizer. Cane makes very heavy draughts upon both nitrogen and potash. On phosphoric acid its demands are relatively small. It should be supplied with fertilizer containing

Phosphoric Acid,	4%
Nitrogen,	6%
Potash,	8%

The application should be made annually at rate of 600 lbs. per acre and thoroughly incorporated with the surface soil by the use of the harrow or cultivator. Where cow-peas or velvet beans have preceded the cane crop, as is the very common practice with successful planters, the amount of nitrogen to be artificially supplied may economically be diminished one-half.

TOBACCO.

(**Tabaco.**)

Tobacco is perhaps more universally recognized as the

distinctive crop of the West India Islands than any other product of their soil, the leaf produced in Cuba being accepted as the standard in the cigar tobacco industry of the world.

Soil. Light, sandy loams, the natural product of which is hard wood trees, predominatingly oak, hickory, magnolia and bay, are distinctively the tobacco soils of Cuba.

Fertilizer. The peculiar adaptations and value of tobacco leaf for cigar purposes being due to the texture and aroma of the leaf, certain fertilizers must be rigorously discarded from all soils from which superior tobacco is expected. Rank, coarse, organic manures, and all mineral fertilizers, such as Muriate of Potash and Kainit containing chlorine, must be especially avoided. Mineral fertilizers, however, of proper composition have proved capable of producing the very highest type of cigar tobacco leaf.

Nitrogen and potash are the main plant food requirements of this crop, phosphoric acid being of relatively little importance in its growth. The burning quality of the leaf, on which so much of its value depends, is largely controlled by the relation between the proportions of the nitrogen and potash supplied the crop. Tobacco requires heavy applications of fertilizer, one ton (2,000 lbs.) to the acre not being an exceptional quantity with successful growers. The application should contain

Phosphoric Acid,	4%
Nitrogen,	5%
Potash,	9%

TOBACCO UNFERTILIZED. NORTH CAROLINA EXPERIMENT FARM, SOUTHERN PINES, N. C.

TOBACCO, FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN (COMPLETE FERTILIZER)—NORTH CAROLINA EXPERIMENT FARM, SOUTHERN PINES, N. C.

TOBACCO FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN (COMPLETE FERTILIZER) CONNECTICUT EXPERIMENT STATION.

TOBACCO FERTILIZED WITH COMPLETE FERTILIZER, CONTAINING 10% POTASH, 14% PHOSPHORIC ACID AND 8% NITROGEN. SANTA ROSA PLANTATION, PINAR DEL RIO, CUBA.

The potash should be supplied in the form of high grade sulphate, sulphate of potash-magnesia, or Silicate of Potash, and the nitrogen preferably from nitrate of soda, cotton-seed-meal or the finest grades of old, and partially decomposed Sea Island guanos. The phosphoric acid is most economically obtained in the shape of acid phosphate, although cotton-seed-meal and guano contain small quantities of this essential.

Tomato.

(Tomates)

Tomato vines should be planted in rows sufficiently wide apart to permit of cultivation by horse and plow. The vines will grow well on most soils, but do best on medium sandy loam. The plants are sensitive to drouth and always require clean cultivation.

Fertilizer. Apply per acre 1,200 lbs. of this fertilizer.

Nitrogen,	4%
Potash,	8%
Phosphoric Acid,	7%

The nitrogen, if used as Nitrate of Soda, should be applied at two different times—first at the beginning of and then during the growing season.

VELVET BEAN.

(Frijoles Aterciopelados.)

This crop is receiving more and more attention as a forage and green manuring substitute for other plants heretofore more extensively used for this purpose. It possesses

certain advantages over any other plant with similar characteristics. It is distinctly sub-tropical in character and makes a very heavy growth of foliage, and thrives perfectly on soil so poor as to be incapable of bearing other leguminous crops. About one-half bushel of seed is required to the acre, sowing being done in furrows about 3 feet apart. An average yield of beans would be from about 20 to 30 bushels per acre, and this quantity plowed under returns to the soil almost exactly the same quantity furnished by 500 pounds of nitrate of soda.

Soil. This is preferably a very light sandy loam, on which the seed should not be planted until warm weather arrives.

Fertilizer. This crop requires no artificial supply of nitrogen ; it should be supplied with a fertilizer containing

Potash,	10%
Phosphoric Acid,	8%

of which about 800 lbs. per acre should be used.

TOBACCO ON SANTA ROSA PLANTATION, PINAR DEL RIO, CUBA.

Composition of Fertilizer Materials Used as Sources of Nitrogen.

	Nitrogen.	Equivalent in Ammonia.	Potash (K_2O.)	Phosphoric Acid Total.
Nitrate of Soda	15 to 16	18 to 19½	.....	.....
Sulphate of Ammonia	19 " 22	23 " 26	.....	.....
Dried-Blood (high grade)	12 " 12½	14½ " 17½	.....	.....
Dried-Blood (low grade)	10 " 11	12 " 14½	.....	3 to 5
Concentrated Tankage	11 " 14½	13½ " 15	.....	1 " 2
Tankage	5 " 6	6 " 7½	.....	11 " 14
Tankage	7½ " 9	9 " 11	.....	8½ " 10½
Dried Fish-Scrap	9½ " 11	11½ " 13½	.....	6 " 8
Cotton-Seed Meal	6½ " 7½	8 " 9	1½%	2%
Castor Pomace	5 " 6	6 " 7½	1%	2%
Tobacco Stems	2 " 3	2½ " 4	5 to 8	about 1%

Composition of Fertilizer Materials Used as Sources of Phosphoric Acid.

	Nitrogen.	Equivalent in Ammonia	Potash (K_2O.)	Phosphoric Acid.		
				Total,	Available.	Insoluble.
So. Carol'a Phos. Rock	.....	.....	.....	26 to 27	.....	26 to 27
So. Carolina Acid Phosphate	.....	.....	.....	13 " 16	12 to 15	1 " 3
Florida Land Rock	.....	.....	.....	33 " 35	.....	33 " 35
Florida Pebble Phosphate	.....	.....	.....	26 " 32	.....	26 " 32
Florida Acid Phosphate	.....	.....	.....	14 " 19	13 to 16	1 " 3
Tennessee Phosphate	.....	.....	.....	34 " 39	.....	34 " 39
Tennessee Acid Phosphate	.....	.....	.....	14 " 19	13 to 16	1 " 3
Bone-Black (spent)	.....	.....	.....	32 " 35	.....	32 " 35
Bone-Black (dissolved)	.....	.....	.....	17 " 19	16 to 17	1 " 2
Bone-Meal	2½ to 4½	3 to 5½	.....	20 " 25	5 " 8	15 " 17
Bone (dissolved)	2 " 3	2½ " 3½	.....	15 " 17	13 " 15	2 " 3
Peruvian Guano	6 " 10	7¼ " 12	1½ to 4	10 " 15	.. 8	2 " 7

Composition of Fertilizer Materials Used as Sources of Potash.

	Pure Potash (K_2O.). Per Ct	Lime Per Ct.	Nitrogen. Per Ct.	Ammonia Per Cent.	Phosp'ric Acid, Total, Per Cent.	Chlorine Per Cent.
Muriate of Potash ...	50	.....	.....	.....	.....	45 to 48
Sulphate of Potash (high grade).....	50to55	.....	.....	.....	.....	0.3 " 1.5
Sulphate of Potash Magnesia	27 " 30	0.85	.....	.....	.....	1.5 " 2.5
Carbonate of Potash Magnesia,.....	18½	.....	.....	.....	.....	.....
Kainit	12½	1.12	.....	.....	.....	30 " 32
Sylvinit,.....	16 " 20	.....	.....	.....	.....	42 " 46
Cotton - Seed - Hull Ashes.....	20 " 30	10	.....	.....	7 to 8	.....
Nitrate of Potash or Saltpeter.....	43 " 45	.....	13to14	16 to 17	.....	.....
Wood - Ashes (unleached).....	2 " 8	30to55	.....	.....	1 to 2	.....
Wood-Ashes (leached)	1 " 2	35 " 40	.....	.....	1 to 1½	.....
Tobacco-Stems	5 " 8	3.5	2 to 3	2½ to 3½	.....	.....

Average Composition of the Most Important Farm Manures.

FARM MANURES.	Nitrogen.	Equivalent in Ammonia.	Potash (K_2O.)	Phosphoric Acid. (P_2O_5)	
				Total.	Lime. (CaO)
Cow-Manure (fresh) ...	0.34	0.41	0.40	0.16	0.3
Horse-Manure (fresh)..	0.58	0.70	0.53	0.28	0.21
Sheep-Manure (fresh)..	0.83	1.00	0.67	0.23	0.33
Hog-Manure (fresh) ...	0.45	0.54	0.60	0.19	0.08
Hen-Dung (fresh).....	1.63	1.98	0.85	1.54	0.24
Mixed Stable Manure..	0.50	0.60	0.63	0.26	0.70